UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Yankee Atomic Electric Company	)	EA 97-387
and		
Duke Engineering & Services Co.		

DEMAND FOR INFORMATION

I

Maine Yankee Atomic Power Company (Licensee or MYAPCo or Maine Yankee) is the holder of Facility Operating License No. DPR-36, issued by the Nuclear Regulatory Commission (NRC or Commission) pursuant to 10 CFR Part 50 on September 15, 1972. The license authorizes the operation of Maine Yankee Atomic Power Station (facility or MYAPS) in accordance with conditions specified therein. The facility is located on the Licensee's site in Lincoln County, Maine.

Yankee Atomic Electric Company (YAEC) provides certain basic components and services to the Licensee. The YAEC LOCA Group provided Loss-of-Coolant-Accident (LOCA) analyses of Emergency Core Cooling System (ECCS) performance, for use in safety and licensing analyses. It is the NRC's understanding that subsequent to the events described in this Demand for Information, Duke Engineering & Services (DE&S) purchased the YAEC LOCA Group.

II

As a result of concerns regarding Small-Break Loss-of-Coolant Accident (SBLOCA) analyses raised by the 1979 accident at Three Mile Island Unit 2, and pursuant to 10 C.F.R. § 50.54(f), the NRC required licensees to submit revised, documented Small-Break Loss-of-Coolant Accident (SBLOCA) analyses which were to meet the guidance of "Clarification of

TMI Action Plan Requirements" (NUREG-0737 or TMI Action Plan), Items II.K.3.30. and II.K.3.31. In response to the guidance of Item II.K.3.30, on January 14, 1983, Maine Yankee submitted a report, YAEC-1300P, "RELAP5YA: A Computer Program for Light Water Reactor System Thermal-Hydraulic Analysis" (RELAP5YA) to the NRC. In January 1989, the NRC approved RELAP5YA for use by Maine Yankee as a 10 C.F.R. Part 50, Appendix K, evaluation model, acceptable to demonstrate compliance with the requirements of 10 C.F.R. § 50.46. RELAP5YA is a generic, non-plant-specific LOCA computer code for calculating ECCS performance over the Small-Break portion of the break spectrum.

Item II.K.3.31 of the TMI Action Plan provides that licensees should submit plant-specific calculations using the SBLOCA evaluation model approved by the NRC pursuant to Item II.K.3.30. Although the NRC approved RELAP5YA as an Appendix K model, YAEC prepared two plant-specific RELAP5YA evaluation models for Maine Yankee in response to TMI Action Plan Item II.K.3.31: a "Best Estimate" model and an Appendix K model.[1]

YAEC developed its "Best Estimate" (BE) RELAP5YA plant-specific evaluation model in June 1990 in order to satisfy a verbal commitment made to the NRC by Maine Yankee in 1989 that the Item II.K.3.31 plant-specific calculations would be completed by June 1990, and because of difficulties in developing an Appendix K evaluation model. YAEC prepared a report of the BE RELAP5YA SBLOCA evaluation model analysis in August 1990. Maine Yankee relied upon that "Best Estimate" RELAP5YA SBLOCA analysis to evaluate the effects of a reduction in steam generator (SG) pressure, as part of a January 1993 written safety evaluation required by 10 C.F.R.

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[1] An Appendix K model is a LOCA evaluation model which complies with the requirements set forth in Appendix K to 10 C.F.R. § 50.46. A best-estimate model is an evaluation model which provides realistic calculations of LOCA phenomena and uses nominal values of input parameters. The "Best Estimate" SBLOCA model developed by YAEC and referred to herein combined the two approaches, such that the limiting SBLOCA case was identified with best-estimate calculations using nominal values of input parameters and the peak cladding temperature of the limiting case was calculated with Appendix K-like models. The Appendix K SBLOCA model developed by YAEC and referred to herein was developed as a strict Appendix K approach.

§ 50.59, in order to determine whether a reduction in SG pressure involved an unreviewed safety question.

YAEC completed its development of an Appendix K RELAP5YA SBLOCA evaluation model, described in its June 1993 report, YAEC-1868: "Maine Yankee Small Break LOCA Analysis" (YAEC-1868). YAEC-1868 states that the Appendix K, RELAP5YA SBLOCA evaluation model was "performed in conformance with the requirements of 10 CFR 50.46 and post-TMI Action Items II.K.3.30 and II.K.3.31....The 10 CFR 50.46 acceptance criteria were met, thus closing out Item II.K.3.31 for Maine Yankee." The Appendix K analysis described in YAEC-1868 was used to prepare Core Performance Analysis Reports (CPARs), which were submitted to the NRC as part of Maine Yankee's reload analyses for Cycle 14 and Cycle 15 operations. The RELAP5YA analysis described in YAEC-1868 was the SBLOCA analysis of record throughout Cycle 14 operations, which occurred between October 14, 1993, and January 25, 1995, but not during Cycle 15 operations because of the intervening January 3, 1996, "Confirmatory Order Suspending Authority for and Limiting Power Operation and Containment Pressure (Effective Immediately), and Demand for Information" (Order).[2] 61 *Fed. Reg.* 735 (January 10, 1996).

The LOCA Group at YAEC prepared the RELAP5YA SBLOCA code and evaluation models for Maine Yankee. The Manager of the LOCA Group (hereinafter,"the Manager") was first employed in the LOCA Group as an engineer in 1980 and has been the Manager of the LOCA Group in the YAEC Nuclear Engineering Department since February 1989. The Manager participated in the development of the RELAP5YA code. The Manager supervised the development of both the BE and Appendix K plant-specific RELAP5YA evaluation models for Maine Yankee, and participated in the preparation of YAEC-1868. The Manager supervises all

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[2] Among other things, the Order limited operation of MYAPS to 2440 MWt, pending NRC review and approval of a plant-specific SBLOCA which conforms to TMI Action Plan Items II.K.3.30 and II.K.3.31 and which meets the requirements of 10 C.F.R. § 50.46.

LOCA work, which includes preparation of CPARs, LOCA codes for other NRC licensees, including Vermont Yankee and Yankee Rowe, and safety analyses. The Lead Engineer in the LOCA Group (hereinafter "the Lead Engineer") has been an engineer in the LOCA group since 1978 and has been the lead engineer for MYAPS LOCA analyses since mid-1990. The Lead Engineer performed the quality assurance review of both the 1990 BE RELAP5YA SBLOCA analysis and the 1993 Appendix K RELAP5YA SBLOCA analysis described in YAEC-1868. On December 4, 1995, the NRC received allegations that, among other things, YAEC, acting as agent for the Licensee, knowingly performed inadequate analyses of the Emergency Core Cooling System (ECCS) to support two license amendment applications to increase the rated thermal power at which MYAPS operates, first to 2630 MWt, and then to 2700 MWt. It was further alleged that YAEC management knew that the ECCS for Maine Yankee, if evaluated in accordance with 10 C.F.R. § 50.46, using the RELAP5YA SBLOCA evaluation model, did not meet licensing requirements.

In response to the allegations, NRC dispatched an Assessment Team to YAEC headquarters between December 11 and 14, 1995, to examine, among other things, SBLOCA analyses, especially the SBLOCA analysis which supported the Licensee's operating cycle 15 (Cycle 15) reload analyses. Based on the Assessment Team's review, and a meeting held with the Licensee on December 18, 1995, the NRC staff issued its January 3, 1996, Order. The staff concluded in the Order, *inter alia*, that the Licensee had not demonstrated that computer code RELAP5YA would reliably calculate the peak cladding temperature for all break sizes in the small-break LOCA spectrum for Maine Yankee and that, for a variety of reasons, the plant-specific application of RELAP5YA did not conform to the requirements of 10 C.F.R. § 50.46 and thus was not acceptable for use by the Licensee. RELAP5YA had been used by Maine Yankee for Cycle 14 SBLOCA analyses, and had been proposed for use by Maine Yankee for Cycle 15 SBLOCA analyses, to demonstrate compliance with 10 C.F.R. § 50.46 requirements for calculating ECCS

performance. The Order required the Licensee to submit a SBLOCA analysis specific to Maine Yankee for operation at power levels up to 2700 MWt, which must meet the requirements of 10 C.F.R. § 50.46, "Acceptance criteria for emergency core cooling systems for light water nuclear power reactors," and which must conform to the guidance of NUREG-0737, "Clarification of TMI Action Plan Requirements", Items II.K.3.30 and II.K.3.31, "SBLOCA Methods" and "Plant-specific Analysis," respectively, and Item II.K.3.5, "Automatic Trip of Reactor Coolant Pumps During LOCA". The Order suspended authority to operate Maine Yankee at 2700 MWt maximum power and limited power to 2440 MWt, pending NRC review and approval of the required SBLOCA analysis.

The NRC also initiated an investigation by the NRC Office of Investigations (OI) to examine possible wrongdoing. OI issued its Report No. 1-95-050 on September 6, 1996.

Based on the Assessment Team review and the OI investigation, the NRC staff concluded that, as a result of Maine Yankee's use of the Appendix K and BE RELAP5YA evaluation models, apparent violations of NRC requirements occurred as set forth in correspondence to MYAPCo[3] (hereinafter "December 19, 1997 letter to MYAPCo") issued concurrently with this Demand for Information. Preparation of LOCA analyses by the YAEC LOCA Group caused Maine Yankee to apparently violate NRC requirements, as explained below.

III

A. <u>During Cycle 14 operations, and in the Cycle 14 and Cycle 15 reload analyses, Maine Yankee used apparently unacceptable evaluation models which could not calculate or reliably calculate ECCS performance.</u>

[3] *See* letter dated December 19, 1997, from H. Miller, Regional Administrator, to M. Sellman, President, MYAPCo.

As set forth in the December 19 letter to MYAPCo, Enclosure 4, Apparent Violations C and D, Maine Yankee used unacceptable evaluation models to calculate ECCS performance during Cycle 14 operations, and in the Cycle 14 and Cycle 15 CPARs used to support reload analyses, in apparent violation of 10 C.F.R. § 50.46(a)(1), because there was a region of the small-break spectrum between break sizes of 0.35 ft^2 and at least 0.6 ft^2 for which no acceptable evaluation model could either calculate or reliably calculate ECCS performance.

To calculate core cooling performance, MYAPCo used the Appendix K, RELAP5YA SBLOCA evaluation model described in YAEC-1868 and the Large-Break Loss-of-Coolant-Accident (LBLOCA) analysis described in YAEC-1160, "Application of Yankee WREM-BASED Generic PWR ECCS Evaluation Model to Maine Yankee" (WREM LBLOCA). YAEC-1868 and YAEC-1160 were prepared by the YAEC LOCA Group for MYAPCo. The CPARs for Cycle 14 and Cycle 15 were also prepared for MYAPCo by YAEC, with the participation of the YAEC LOCA Group.

In order for LOCA codes to be acceptable, they must not only be capable of calculating any point on the break spectrum, but must be capable of producing reliable calculations. RELAP5YA was not capable of calculating at break sizes of and greater than 0.35 ft^2. While the WREM LBLOCA code was capable of calculating ECCS performance at break sizes of 0.6ft^2 and above[4], those calculations would have been unreliable at break sizes of 0.6 ft^2 and some portion of the break spectrum above 0.6 ft^2. Because LBLOCA codes cannot be assumed to produce reliable or acceptable results in the Small-Break region, in order for the WREM LBLOCA code to be acceptable for calculating cooling performance in the Small-Break region of and greater than 0.6 ft^2, it would have been necessary to verify WREM LBLOCA results in that region of the break

[4] The WREM LBLOCA code analyzed break sizes of and greater than 3.6 ft^2 in the Cycle 14 and Cycle 15 reload analyses. At the request of NRC staff in early 1996, Maine Yankee analyzed break sizes further down the spectrum with the WREM LBLOCA code, and ultimately did so down to .6ft^2. Since no changes were made to the WREM LBLOCA code in so doing, it is apparent that the WREM LBLOCA code was capable of performing calculations in the Cycle 14 and Cycle 15 reload analyses for break sizes down to 0.6 ft^2.

spectrum against test data in order to estimate those uncertainties. The WREM LBLOCA evaluation model, however, was not used to calculate ECCS performance in the Small-Break region of and greater than 0.6ft^2 for Cycle 14 or Cycle 15, and likewise was not verified against applicable test date in that region of the break spectrum.[5] Because MYAPCo's ECCS analyses, singly or combined, were not capable of acceptably calculating any point on the break spectrum, it was not possible to analyze any point on the break spectrum and thus to confirm that the limiting break had been identified.

The Manager of the LOCA Group had the primary responsibility at YAEC for ensuring that LOCA codes developed by YAEC complied with 10 C.F.R. § 50.46 and 10 C.F.R. Part 50, Appendix K requirements, and the responsibility for bringing compliance problems to the attention of YAEC management. It is necessary for engineers in the LOCA Group to be familiar with Section 50.46 requirements in order to adequately perform their duties. The Lead Engineer told OI investigators that she understood that her job description required her to be familiar with 10 C.F.R. § 50.46 and Appendix K, and that she was expected to report compliance problems to the Manager.

The Manager and the Lead Engineer were identified by the YAEC-1868 report as "major contributors" to the RELAP5YA analysis described in YAEC-1868. The Manager participated in the development of the RELAP5YA code, supervised the development of the RELAP5YA analysis described in YAEC-1868, and was one of the preparers of YAEC-1868. The Manager of the LOCA Group supervised all LOCA work, which includes the LBLOCA analyses for Maine Yankee. The Lead Engineer was employed in the LOCA Group as an engineer in 1978, has been the

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[5] Neither the 1996 performance of the WREM LBLOCA code down to break sizes of 0.6 ft^2, nor any verification against test data in 1996, even if it had been done, would have made the WREM LBLOCA code acceptable for use in calculating break sizes down to 0.6 ft^2 during Cycle 14 operations or the Cycle 14 and Cycle 15 reload analyses. Section 50.46(a)(1) requires that an ECCS code be acceptable *before* being used, and does not permit the substitution of engineering judgement for the ability to analyze any point on the break spectrum to confirm that the limiting breaks were identified.

principal engineer for Maine Yankee LOCA analyses since mid-1990, and performed the quality assurance review of the RELAP5YA SBLOCA analysis described in YAEC-1868. As a result of their duties, the Manager and the Lead Engineer were also familiar with the WREM LBLOCA evaluation model and analyses developed and performed by YAEC for use by Maine Yankee. Additionally, the CPARs for Cycle 14 and Cycle 15 were prepared with the participation of the YAEC LOCA Group, including the Lead Engineer, and approved by the Manager, among others.

The apparent failure of the RELAP5YA SBLOCA analysis described in YAEC-1868 to comply with Section 50.46(a)(1) is of heightened concern because the oscillations and instability in the analysis became more severe at larger break sizes, increasing the risk that the limiting breaks had not been identified. The Lead Engineer told OI investigators that although RELAP5YA had failed at 0.35 ft^2, she nonetheless believed, during her review of YAEC-1868, that the worst case had been bounded (the limiting transient had been identified). The Manager told OI investigators that, despite the fact that RELAP5YA had failed at 0.35 ft^2, he was nonetheless confident, during the development of the RELAP5YA SBLOCA analysis reflected in YAEC-1868, that the limiting break had been identified because Peak Cladding Temperature calculations had trended downward with increasing break size. This rationale is neither acceptable nor credible because, as explained above, RELAP5YA experienced increasing oscillations as break size increased and because there was a portion of the break spectrum for which there was no acceptable evaluation model capable of calculating cooling performance.

In view of the above, it is reasonable to conclude that the Manager and the Lead Engineer knew that there was a portion of the break spectrum between 0.35 ft^2 and at least 0.6 ft^2 for which no NRC-approved, acceptable LOCA evaluation model was capable of either calculating or reliably calculating cooling performance.

In view of the above, it is also reasonable to conclude that as a result of its preparation and review of the RELAP5YA SBLOCA analysis described in YAEC-1868, and its preparation and

approval of the CPAR's used to support MYAPCo's Cycle 14 and Cycle 15 reload analyses, YAEC caused MYAPCo to be in apparent violation of 10 C.F.R. § 50.46(a)(1).

B. MYAPCo maintained information and submitted to the NRC Core Performance Analysis Reports, in support of Cycle 14 and Cycle 15 reload applications, which apparently were not complete and accurate in all material respects .

As set forth in the December 19, 1997 letter to MYAPCo, Enclosure 4, Apparent Violation E, Maine Yankee maintained information and submitted to the NRC Core Performance Analysis Reports (CPARS), in support of Cycle 14 and Cycle 15 reload analyses, which were not complete and accurate in all material respects, in apparent violation of 10 C.F.R. § 50.9(a). MYAPCo used the RELAP5YA SBLOCA analysis described in YAEC-1868[6] to prepare the CPARs in order to demonstrate compliance with 10 C.F.R. § 50.46. YAEC-1868, in its entirety, conceals the lack of an acceptable evaluation model to calculate ECCS performance for a portion of the break spectrum between 0.35 ft^2 and at least 0.6 ft^2 (*see* Section III.A., *supra*) by making statements which imply that the complete break spectrum was analyzed or capable of analysis, and by stating that a sufficient number of break sizes was analyzed such that the limiting LOCA conditions were identified in conformance with the requirements of 10 C.F.R. § 50.46(a)(1).

Through its submission of YAEC-1868 to MYAPCO, YAEC provided to MYAPCo information required to be maintained by the NRC which apparently was not complete and accurate all material respects. Based upon the Assessment Team review and the OI investigation, it appears that no Maine Yankee personnel realized that the RELAP5YA code failed at 0.35 ft^2 or that there might be a portion of the break spectrum for which there was no acceptable evaluation model to calculate ECCS performance, and that no one at YAEC informed MYAPCo personnel that RELAP5YA had failed at 0.35 ft^2. The Manager told OI investigators that he did not think that

[6] YAEC-1868 is a record required to be maintained by the NRC because it is part of the documentation underlying the CPARs, which are records required to be maintained by 10 C.F.R. § 50.71.

the failure of RELAP5YA at 0.35 ft^2 was significant, and does not recall discussing this failure of RELAP5YA with the manager in charge of the Engineering Section of the Licensing and Engineering Group of MYAPCo, who was the MYAPCo manager kept directly apprised by YAEC and by the Manager of the development of the plant-specific RELAP5YA evaluation models on a continuing basis.

Statements in YAEC-1868 that RELAP5YA "terminated" after SIT actuation for the 0.35 ft^2 break size case (*see* YAEC-1868, at 22) do not reveal the non-compliance with 10 C.F.R. § 50.46(a)(1). That language would not signify to an individual without expertise in LOCA codes that RELAP5YA had failed and was not capable of calculating ECCS performance at break sizes of and greater than 0.35 ft^2. If YAEC-1868 had explicitly stated that RELAP5YA failed at 0.35 ft^2 and was not capable of calculating ECCS performance at break sizes of and greater than 0.35 ft^2, and that there was no NRC-approved, acceptable evaluation model which could analyze a portion of the break spectrum, the description of the RELAP5YA SBLOCA evaluation model would have been complete and accurate.

The Manager participated in the development of the RELAP5YA code, supervised the development of the RELAP5YA evaluation model described in YAEC-1868, and assisted in the preparation of YAEC-1868. The Lead Engineer performed the quality assurance review of RELAP5YA SBLOCA analysis described in YAEC-1868. Both the Manager and the Lead Engineer were familiar with the WREM LBLOCA analysis developed by YAEC for Maine Yankee. It is reasonable to conclude that the Manager and the Lead Engineer knew that there was a portion of the break spectrum, between break sizes of 0.35 ft^2 and at least 0.6 ft^2, for which no NRC-approved, acceptable LOCA evaluation model was capable of either calculating or reliably calculating cooling performance. (*See* Section III.A, *supra*).

Based on the above, it is reasonable to conclude that, as a result of YAEC's preparation and review of YAEC-1868, YAEC provided MYAPCo with information that was not complete and

accurate in all material respects, and thus caused MYAPCO to be in apparent violation 10 C.F.R. § 50.9(a).

C. During Cycle 14 operations and in the Cycle 14 and Cycle 15 CPAR, MYAPCo used an apparently unacceptable SBLOCA evaluation model which over predicted core cooling.

As set forth in the December 19, 1997 letter to MYAPCo, Enclosure 4, Apparent Violations F and G, the RELAP5YA SBLOCA evaluation model described in YAEC-1868, used to calculate core cooling performance in Cycle 14 operations and in the Cycle 14 and Cycle 15 CPARs, apparently did not satisfy the requirements of 10 C.F.R. § 50.46(a)(1), because as a result of incorrect calculations of the penetration factors, which arose from misapplication of the Alb-Chambre penetration correlation[7], the analysis provides no basis to assume full penetration of the emergency core cooling system injection and provides no basis to derive the loss coefficient of 600 used for the split downcomer nodalization. These deficiencies resulted in over prediction of core cooling and overstatement of the conservatism of the model.

Junction 057[8] was the only communication between the intact loop and the broken loop downcomers. A very large loss coefficient of 600, compared to 0.6 in the original model, is used for Junction 057 in YAEC-1868. The loss coefficients were calculated based on penetration factors ranging from 0.96 to 1.0. If the Alb-Chambre correlation had been applied correctly, penetration factors would have been calculated in the range of -0.6657 to -0.7767, which is a meaningless

[7] The Alb-Chambre Correlation is an empirical correlation developed by Gary P. Alb and Paul L. Chambre ("Correlations for the Penetration of ECC Water in a Model of A PWR Downcomer Annulus," Nuclear Engineering and Design, 53, PP 237-248) for calculation of the penetration factor of the injected ECCS water penetrating the downcomer annulus into the lower plenum.

[8] A junction is a connection that provides a flow path or communication between two nodes, or volumes, in a plant nodalization model. Junction 057 is the flow junction between two halves (nodes) of the downcomer in the reactor vessel downcomer nodalization scheme.

result because the calculations would have been less than zero.[9] Such calculations also indicate other possible errors in application of the Alb-Chambre correlation.

The Manager supervised the preparation of RELAP5YA SBLOCA analysis described in YAEC-1868, and the Manager was one of the preparers of the YAEC-1868 report. The Lead Engineer performed the Quality Assurance (QA) review of the analysis described in YAEC-1868. The Manager and the Lead Engineer should have realized during their work associated with the RELAP5YA analysis described in YAEC-1868 that the Alb-Chambre correlation had been incorrectly applied. In particular, an adequate QA review would have revealed the errors and the unacceptability of the RELAP5YA SBLOCA analysis described in YAEC-1868.

In view of the above, it is reasonable to conclude that YAEC caused MYAPCo to rely on an unacceptable SBLOCA evaluation model in apparent violation of 10 C.F.R. § 50.46(a)(1).

D. MYAPCo used an apparently unacceptable Best Estimate RELAP5YA SBLOCA evaluation model to calculate ECCS performance.

As set forth in the December 19, 1997 letter to MYAPCo, Enclosure 4, Apparent Violation H, MYAPCo performed a safety analysis in order to determine if a decrease in steam generator pressure involved an unreviewed safety question, pursuant to the requirements of 10 C.F.R. § 50.59, and in so doing used an unacceptable Best Estimate RELAP5YA evaluation model to calculate SBLOCA ECCS performance, in apparent violation of 10 C.F.R. § 50.46(a)(1). The Section 50.59 analysis was prompted by equipment degradation which had caused a reduction in

[9] A penetration factor is the fractional or partial penetration of ECC injection water into the downcomer, defined as the ratio of the volumetric flow rate of the ECC water penetrating into the lower plenum to the volumetric inlet flow rate. The penetration factor ranges from 0 for no penetration (total bypass) to 1 for full penetration. Penetration factors either greater than 1 or less than 0 are meaningless because they are physically impossible.

SG pressure, which was possibly a non-conforming condition, as the operating SG pressure had fallen below the pressure assumed in the SBLOCA analysis of record.[10]

MYAPCo's January 1993 Section 50.59 analysis relied upon an analysis of the effect of the reduction in SG pressure on ECCS performance prepared by YAEC, which used, among other analyses, the Best Estimate (BE) RELAP5YA SBLOCA analysis. The YAEC LOCA Group prepared "Impact of Low Steam Generator Pressure on LOCA Analysis" (LOCA 91-04), dated January 25, 1991, which used the June 1990 BE RELAP5YA analysis for the SBLOCA portion of the study. LOCA 91-04 was approved by the Manager of the YAEC Nuclear Engineering Department for the Manager. A YAEC Memorandum, "Impact of Lower Steam Generator Pressure on the Safety Analysis" (NED 91-18), dated January 28, 1991, relied on LOCA 91-04 to evaluate the impact of reduced steam generator pressure on the MYAPCo safety analysis. The Manager was provided a copy of NED 91-18, which was also transmitted to the Vice President of MYAPCo Licensing and Engineering, on January 28, 1991. Finally, in a YAEC memorandum dated May 29, 1992, and titled "Steam Generator Pressure and Heat Transfer Coefficient Monitoring", YAEC concluded that "the lower initial SG pressure did not affect the results of the licensing analysis," based in part on NED 91-18. The May 29, 1992, memorandum states: "This memo is safety-related". The Manager approved the May 29, 1992, memorandum, which was transmitted to the Vice President of MYAPCo Licensing and Engineering on June 1, 1992. The MYAPCo Section 50.59 analysis of reduced steam generator pressure referenced and relied upon NED 91-18[11] and the May 29, 1992 memorandum.[12]

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[10] The SG pressure assumed in the SBLOCA analysis of record (the CE SBLOCA analysis) between Cycle 4 and mid-Cycle 13, and thus at the time of the January 1991 SG pressure reduction analysis performed pursuant to Section 50.59, was approximately 877 psig. An internal memorandum from F. John Card, dated April 7, 1989 (File 14.82, 2.10), states that on April 6, 1989, at full power, SG pressure was 827 psig, and that on October 30, 1984, at 2630 MWt SG pressure was 825 psig.

[11] Maine Yankee's "Technical Evaluation" associated with the Section 50.59 analysis referenced NED 91-18 as MYP 91-0098, the identification number Maine Yankee assigned to NED

(continued...)

A Section 50.59 analysis cannot confirm that ECCS performance will be adequate unless the Section 50.59 analysis uses LOCA evaluation models acceptable to demonstrate compliance with 10 C.F.R. § 50.46. Maine Yankee's reliance upon the BE RELAP5YA model was in apparent violation of 10 C.F.R. § 50.46(a)(1) because the January 1989 NRC SER approved RELAP5YA for application to Maine Yankee as a full Appendix K evaluation model, not as a BE evaluation model, to demonstrate compliance with 10 C.F.R. § 50.46. Additionally, the BE RELAP5YA evaluation model apparently did not comply with 10 C.F.R. Part 50, Appendix K, because: (1) the BE model calculated decay heat with the 1979 ANS Standard rather than the required 1971 ANS Standard plus 20 percent; and (2) the BE model calculated the two-phase critical flow with the RELAP5YA mechanistic model rather than the required Moody critical flow model.

It is reasonable to conclude that the Manager of the YAEC LOCA Group was aware, before the studies of the impact of reduced steam generator pressure on LOCA analyses were performed, that the BE version of RELAP5YA did not conform to the SER and that its use without NRC approval would be unacceptable. A memorandum dated January 2, 1990, prepared by the Manager, states that the Best Estimate RELAP5YA SBLOCA code, which the Manager had proposed to develop to resolve the Three Mile Island Action Plan Item II.K.3.31, differs from the approach approved by the SER, and suggests that a summary report describing the proposed BE method and results be submitted to the NRC. The Manager told OI investigators that this had not been done, that he believed that MYAPCo personnel had discussed the possibility of a BE approach to close out Item II.K.3.31 with the NRC Project Manager for MYAPCO, that the NRC staff did not issue an approval of that proposal, that the Manager was not aware of any NRC

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[11](...continued)
91-18 upon its receipt.

[12] Maine Yankee's "10 CFR 50.59 Determination" referenced the May 29, 1992 memorandum as MYP 92-0605, the identification number Maine Yankee assigned to the May 29, 1992 YAEC memorandum upon its receipt.

approval of that proposal, and that he believed that the BE RELAP5YA model would not be acceptable for use in licensing matters.

It is also reasonable to conclude that the Manager knew that the analysis which YAEC performed regarding the effects of a reduction in steam generator pressure on LOCA analyses was a safety analysis which would be used by Maine Yankee in a Section 50.59 analysis or other safety analysis. The Manager stated to OI investigators that he did not know whether the YAEC analyses were in fact used by Maine Yankee to perform a Section 50.59 analysis. Because of the very nature of their work, however, LOCA group engineers, including the Manager, would have to have known that the YAEC analyses of SG pressure reduction were intended by Maine Yankee to be used for a Section 50.59 or other safety analysis. The October 31, 1990, Maine Yankee Service request (MY-A-24-82, Rev. 3), NED 91-18, "Impact of Lower Steam Generator Pressure on the Safety Analysis", and the May 29, 1992 memorandum, "Steam Generator Pressure and Heat Transfer Coefficient Monitoring", explicitly state that the YAEC studies were performed to determine the effect of the SG pressure reductions upon the MYAPS safety analysis. In view of the intended use of the YAEC analysis, the Manager should have provided Maine Yankee with an analysis which met NRC requirements.

In view of the above, it is reasonable to conclude that by approving the use of and by providing to Maine Yankee an unacceptable analyses of the effects of reductions in SG pressure on LOCA analyses, YAEC caused Maine Yankee to apparently violate 10 C.F.R. § 50.46(a)(1) by relying on an unacceptable SBLOCA evaluation model to calculate ECCS cooling performance in preparing a Section 50.59 analysis.

IV

The foregoing situation raises serious questions concerning regard for and adherence to NRC requirements and concerning management control and supervision over licensed activities. Questions are raised as to whether YAEC and/or DE&S will in the future provide complete and accurate information to licensees and to the NRC; whether YAEC and/or DE&S are willing and able to otherwise conduct their activities in accordance with the Commission's requirements; and whether YAEC and/or DE&S should be permitted to provide LOCA analyses or other safety-related analyses to NRC licensees.

Further information is needed to determine whether the Commission can have reasonable assurance that in the future licensees can rely upon YAEC and/or DE&S to provide complete and accurate information; whether YAEC and/or DE&S are willing and able to otherwise conduct its activities in accordance with the Commission's requirements; and whether YAEC and/or DE&S should be permitted to provide LOCA analyses or other safety-related analyses to NRC licensees.

V

Accordingly, pursuant to sections 161c, 161o, 182 and 186 of the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 C.F.R. § 2.204, the Commission needs the following information to determine whether enforcement action should be taken against Yankee Atomic Electric Company (YAEC) and/or Duke Engineering & Services (DE&S) Company to ensure future compliance, on the part of NRC licensees, with NRC requirements:

A. An explanation why, in view of the matters set forth above, the NRC should permit any NRC Licensee to use the services of YAEC LOCA Group and/or DE&S, to the extent that YAEC LOCA Group was transferred to DE&S, to

perform LOCA analyses or any safety-related analyses to meet NRC requirements.

B. An explanation why the NRC should not consider the inadequate analyses, which apparently caused MYAPCo to be in violation of NRC requirements, to be the result of wilfulness, either deliberateness or careless disregard, on the part of YAEC and/or DE&S personnel.

VI.

Yankee Atomic Electric Company and Duke Engineering & Services Co. are required to submit their responses in writing and under oath or affirmation, to the Director, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, within 30 days of the date of this Demand for Information. Copies also shall be sent to the Director, Office of Enforcement , the Assistant General Counsel for Hearings and Enforcement at the same address, and to the Regional Administrator, NRC Region I, 475 Allendale Road, King of Prussia, PA 19406-1415.

After reviewing the responses, the NRC will determine whether further action is necessary to ensure compliance with regulatory requirements.

FOR THE NUCLEAR REGULATORY COMMISSION

Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland
this __ day of December, 1997